

COMPARATIVE HAEMOLYMPH PROTEIN CONTENT IN GEN-3

BIVOLTINE RACE OF *BOMBYX MORI L.* WITH

SUPPLEMENTATION OF VITAMIN-C & E

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ABSTRACT

Haemolymph of silkworm plays a very essential role in its development. GEN-3, a pure bivoltine race was selected for the current study. Fifth instars of GEN-3 race were chosen randomly and fed with mulberry leaves treated with vitamin C and vitamin E separately. The haemolymph protein content was extracted and variations were recorded. It was found that the silkworms treated with vitamin C exhibited better result than vitamin E and high yield was noticed throughout the developmental period.

KEYWORDS: Haemolymph, Bivoltine, Mulberry Leaves, Vitamin C& E

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INTRODUCTION

Sericulture is the skill of silk farming including cultivation of silkworm *Bombyxmori L.*, its host plant and conversion of silkworms to silk yarn. *Bombyxmori L.* is a holometabolous lepidopteron that exclusively feeds on mulberry plant *Morus* species. Vitamin-C present in the mulberry leaves played a crucial role in the growth and development of silkworm. Considering the antioxidant and other properties, supplementation of vitamin-C in the diet was expected and was considered for the study. Vitamin-C is also an essential source for metamorphosis and development of an organism. Haemolymph also called as the blood of the silkworm is an extracellular fluid in which the organs of the insect are suspended. Many corpuscles or haemocytes are present in the fluid and plays an active role in the defense mechanism of the organism. Many proteins, amino acids along with a large amount of water are also present. During the development of the organism, major changes occur in protein content (Wyatt, 1967; Agosin, 1978). Plasma protein is formed in the fat-bodied cells and then secreted into the haemolymph intermittently during the postembryonic period and metamorphosis (Sakai et al., 1988, Mori et al, 1991, Kishimoto et al., 1999). During metamorphosis, some of the storage protein breaks down to free amino acids which are highly essential during the adult stage. The silkworm displays open circulatory system containing haemolymph which surrounds the organ. Haemolymph helps in transportation of many nutrients and oxygen to different parts of the body. The nutritional elements of the host plant plays a key role in the nutrition of silkworms and in turn cocoons and silk production (Nagaraju, 2002). The silkworm is monophagous it solely survives on mulberry leaves. Nutrition affects the haemolymph protein content of the silkworm. So in order to enhance supplementation of extra-nutritional diet through vitamin-C is highly essential. The present work was intended to study a comprehensive analysis of haemolymph protein content treated with vitamin C & E on GEN-3 race of silkworm

Bombyxmori L.

MATERIALS AND METHODS

GEN-3, a bivoltine race was collected from the rearing place Berhampore (West Bengal). This race was reared by providing the optimum conditions of temperature, humidity and up to the fifth instar of silkworm larva (Krishnaswamy, 1978) 24⁰Cto 28⁰C was recommended for the rearing of the silkworm. The dietary efficiency in larval condition shows highly significant inresulting the pupae, adult, and production of silk (Aftab et al., 1999). The larvae were fed normally the mulberry leaves up to the fourth instar. On the advent of the fifth instar, the GEN-3 (Figure 1) silkworm race was grouped randomly in 50 numbers and was classified as control, vitamin-C and vitamin-E in three different rearing trays.



Figure 1: GEN3, Mulberry Plantation and Fifth Instar of GEN-3 Silkworm Larva

Fresh leaves of mulberry were dipped in 1% of taken vitamin-C and vitamin E and then the leaves were subjected under fanning for 15 minutes. Thereafter the leaves were nourished to the silkworms. After two meals the larvae were weighed individually by electric digital balance. The body weight was recorded and then the haemolymph was collected by piercing the last abdominal leg of the insect. The haemolymph was collected in thiourea to avoid oxidation. For the estimation of protein content in the haemolymph of silkworm, the method of Lowry (1951) was adopted.

RESULTS AND DISCUSSION

Haemolymph serves as a medium of transportation of nutrients, hormones, and many metabolites. It is also very important for the development and metamorphosis of insects. Considering the dynamic role of haemolymph protein in body metabolism an attempt has been made to evaluate the chemical analysis of haemolymph protein content in GEN-3 race of silkworm *Bombyxmori L.* with supplementation of vitaminC. Table-1 shows the comparison of haemolymph protein content in control and treated with vitamins. There was a progressive increment in haemolymph protein content up to the sixth day of the larva in both the category of control and treated with vitamin C. It is clearly observed that haemolymph protein content while treated with vitamin C yields better results in comparison to E.

Table 1: Comparison in the Concentration of Haemolymph Protein (mg/ml.)

5th Instar Duration	Vitamin C	Control	Vitamin E
1 st Day	12.97292 ± 0.428955	11.70504 ± 0.513952	11.12689 ± 0.18744
2 nd Day	14.4335 ± 0.09157	12.44548 ± 0.173175	12.25276 ± 0.196157
3 rd Day	15.83325 ± 0.252253	14.40308 ± 0.180734	14.09879 ± 0.113402
4 th Day	27.41657 ± 0.192183	26.73699 ± 0.129696	24.6881 ± 0.140179
5 th Day	30.04361 ± 0.1058962	29.37418 ± 0.105653	27.45715 ± 0.18116
6 th Day	31.392636 ± 0.1951048	29.66832 ± 0.10269	29.29303 ± 0.175389
7 th Day	30.084187 ± 0.0898674	28.93803 ± 0.095689	28.64388 ± 0.109244

Vitamin C is regarded as the potential stimulator of protein synthesis; it could be used at a lower concentration as well for the benefits of sericulture industries (Sathesh & Kerenhap, 2016). The synthetic vitamin C is highly effective against protein synthesis, more particularly with minimum doses of one percent (Thulasi & Sivaprasad, 2013). After the sixth day, a significant decrement was noticed. Vitamin diets are essential in the trace for growth and development of the silkworm races. Extra nutrients give better result. *Bombyxmori L.* Larvae can be fed with bovine milk treated with mulberry leaves for increased growth rate and silk production (Konala, 2013). Vitamins present in mulberry leaves satisfy the minimum needs of the silkworm. Mostly the result shows that the protein content in the haemolymph is getting affected by the content of vitamins present in the diet. By viewing the antioxidant property of vitamin C, it can better fit into the biochemical need of the organism. It is believed to protect the DNA and membrane lipid from damage due to oxidation. Many researchers are of the view that the effect the vitamin supplementation definitely has an impact on the growth of *Bombyxmori L.* (Nirwani & Kaliwal, 1998; Mossalaniejad, 2002; Etabari et al., 2004; Rajabi et al., 2006). In the present study the silkworm treated with vitamin C yields a better result in comparison to E and additionally it has the antioxidant property to enhance the leaf quality enhancing the phagostimulatory effect. The protein content increased due to vitamin C though an excessive amount of vitamin C has a negative impact (Sundara et al., 2018). Further addition of probiotics may be useful to increase the protein content of silkworm larvae (Rexin & Vasanth, 2017).

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